WHAT IS CLAIMED IS:

1. A chemical mechanical polishing (CMP) apparatus comprising:

a rotating polishing platen having a first diameter,

a wafer carrier for holding a wafer in cooperative relationship with said rotating platen, said wafer carrier having multiple chambers that allow for independently varying pressure within the chambers that urge against the wafer at corresponding multiple localized zones on the wafer,

at least one window formed in said polishing platen whereby said window is periodically scanned across a wafer, and

an optical detection system carried on said platen for transmitting light through said window and receiving light reflected from the wafer through said window as it rotates past the wafer, to detect the reflectance of materials on the surface of the wafer at the multiple localized zones.

2. The CMP apparatus of claim 1 wherein the reflectance is used to stop the polishing independently within each of the multiple localized zones.

3. The CMP apparatus of claim 1 wherein the reflectance indicates the state of polishing of the wafer within each of the multiple localized zones.

4. The CMP apparatus of claim 1 further comprising:

a controller, which receives reflectance signals representing the reflectance of materials on the surface of the wafer at the multiple localized zones from the optical detection system, and said controller is configured to process said reflectance signals to determine the state of polishing within each of the localized regions, and to selectively vary the pressure independently within each of the multiple chambers responsive to said state of polishing determination.

5. The CMP apparatus of claim 1 wherein said multiple chambers are formed in a flexible membrane and comprise a center chamber surrounded by one or more concentric chambers.

6. The CMP apparatus of claim 1 wherein the multiple chambers comprise a center circular chamber and three annular, concentric chambers.

7. The CMP apparatus of claim 1 wherein said optical detection system further includes at least one fiber optic sensor having a bundle of transmit and receive optical fibers terminating at a sensor tip, a light source which transmits light through the transmit optical fibers to the surface of the wafer, and a photodector which receives reflected light from the surface of the wafer through the receive optical fibers.

8. The CMP apparatus of claim 7 wherein said transmit and receive optical fibers are oriented substantially normal to the surface of the wafer.

9. The CMP apparatus of claim 7 wherein the sensor tip is spaced apart from the surface of the wafer to form a gap, and the size of the gap is in the range of about 200 to 250 mils.

10. The CMP apparatus of claim 7 wherein the light source is a light emitting diode which emits light at a wavelength of about 880 nm.

11. The CMP apparatus of claim 1 wherein the materials on the surface of the wafer are any one of, or a combination of, conductive, insulating or barrier materials.

12. The CMP apparatus of claim 11 wherein said materials may be patterned on the surface of the wafer.

13. The CMP apparatus of claim 1 wherein the window scans through the center of the wafer.

14. A method of chemical mechanical polishing (CMP) of a semiconductor wafer, comprising the steps of:

providing a CMP machine which includes a polishing pad and a wafer carrier having multiple chambers that allow for independently varying pressure within the chambers that urge against a wafer at corresponding localized zones on the wafer;

measuring the reflectance of the surface of the wafer during polishing at each of the localized zones on the wafer;

processing the reflectance data to determine the state of polishing within each of the localized zones; and

independently adjusting the pressure within any one of the chambers responsive to the state of polishing within each of the corresponding localized zones.

15. The method of claim 14 wherein the step of independently adjusting further comprises:

reducing or stopping the chemical mechanical polishing, independently within each zone when a change in the reflectance is measured in that zone.

16. The method of claim 15 wherein the chemical mechanical polishing is reduced or stopped in a zone when the change in reflectance is in the range of about 25 to 60 %.

17. The method of claim 15 wherein the chemical mechanical polishing is reduced or stopped in a zone when the change in reflectance exceeds a predetermined threshold value.

18. The method of claim 14 wherein the step of independently adjusting further comprises:

reducing or stopping the chemical mechanical polishing, independently within each

zone according to prior reflectance measurements.

19. The method of claim 14 further comprising:

detecting the amount of scattering in the reflectance data;

determining the degree of topographical variations on the surface of the wafer based on the amount of scattering at the localized zones; and

controlling the polishing process at the localized zones on the wafer responsive to said topographical variations.